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ABSTRACT

The goal of the investigation was to eliminate the disruptive, resistant and assaultive behaviors and increase the appropriate peer interaction of an economically disadvantaged kindergarten white boy. The treatment program involved presentation of adult (teacher) attention contingent upon desirable classroom behavior, withholding of attention contingent upon inappropriate behavior, and social isolation contingent upon unacceptable behavior. The subject's behavior was classified according to the Coping Analysis Schedule for Educational Settings, and the teacher's interactions with the subject were categorized according to their content. Behavior and interactions were recorded by an observer. The program was carried out daily in the activities of free play, discussion, and rest. The subject's inappropriate and unacceptable behaviors significantly decreased when they were punished (isolation) rather than ignored. A reversal of the treatment program was introduced to demonstrate that the teacher's interactions were in fact the controlling variables. Reinstatement of data treatment had favorable results. The study indicates that the systematic use of social reinforcement techniques in the classroom can significantly change a child's behavior, even when the target is more comprehensive than the single operant. (Author/NH)

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Modification of the Classroom Behavior of a "Disadvantaged" Kindergarten Boy by Social Reinforcement and Isolation

By

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Acknowledgements

The small number of subjects, namely one, involved in the present investigation may yield a false estimate of the amount of work required. A tremendous amount of data was obtained from the one subject and one teacher involved, and considerable rearrangement of the child's classroom environment was required.

Consequently, the authors owe a great deal of appreciation to Mrs. Jean Rooks and Miss Aloha Peyton, teachers of the EIP kindergarten, for their cooperation, which hopefully did not interfere with their many other responsibilities. The encouragement of Dr. Nicholas Anastasiow, EIP Program Director, was an essential ingredient in the successful completion of the study.

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The last few years have brought an increasing interest in the application of operant conditioning theory and techniques to children's behavior problems. Reinforcement theory focuses on understanding a child's behavior as a function of the present environmental consequences of his behavior and the child's past interactions with his environment. Ullman and Krasner (1965) have edited a series of case studies in this area, the majority of which focus upon deviant behaviors in children and schizophrenic adults. Staats (1964) has also compiled a number of studies that extend conditioning principles to complex human behavior, mainly verbal behavior, communication and social learning.

In the experimental analysis of behavior there are two functional classes of resporses:

1. Respondents, behavior controlled by preceding stimuli and generally insensitive to consequent stimulation, and

2. Operants, behavior controlled primarily by consequent stimulation.

In general, operant behavior is a primary concern because it appears to describe most accurately the greater part of human activity. Stimuli are defined as properties (physical, chemical, social) of the organism's environment which interact with his behavior in four basic functional relationships. When a stimulus functioning as a positive reinforcer is presented, the behavior is strengthened. When a stimulus functioning as a punishment by "hurt" is presented, the behavior is weakened. When a stimulus functioning as a negative reinforcer is removed or avoided, the behavior is strengthened. Finally, when a stimulus functioning as a punishment by "loss" is removed or avoided, the behavior is weakened. The practice of isolation or "time-out," is frequently used as a punishment by "loss" in behavior modification techniques. Extinction, the discontinuance of one of the above relationships, is another important response-stimulus relationship. Whenever a previously conditioned

response is continuously emitted without being followed by reinforcement, the response typically decreases in frequency of occurence.

Most demonstrations of operant techniques with human behavior have been in laboratory situations. However, several studies which illustrate the application of reinforcement principles to nursery and kindergarten children in classroom situations have been conducted. Harris et al. (1964) carried out a study using positive social reinforcement to substitute well-developed walking behavior for the regressed crawling behavior of a three-year-old girl. Allen et al. (1964) conducted a study in which the teachers used positive social reinforcement (adult attention) to help a child showing persistent and marked isolate behavior to achieve and maintain more play relationships with her peers. Another investigation was undertaken by Johnston et al. (1966) employing a planned schedule of positive social reinforcement to promote successfully vigorous physical activity of an inactive, uncoordinated three-year-old boy. Brison (1966) used the technique of social extinction of nonverbal communication to encourage a kindergarten child to talk. Finally, Staats (1964) reported on a study comparing token reinforcement, social reinforcement, and no reinforcement of reading behavior of four-year-old children. The results showed that when reading was reinforced, attentional and work habits were strong and new words were learned rapidly, whereas both types of behavior deteriorated when reinforcement was not forthcoming. Thus, this research indicates that reinforcement principles provide effective and desirable means for changing specific behaviors.

The present investigation was undertaken to determine whether a program of social positive reinforcement and punishment could discourage the disruptive and resistant behavior of a five-year-old "culturally deprived" boy. A secondary goal was to explore the applicability

of a comprehensive behavior classification system in a behavior modification study. The reinforcing kindergarten teacher used systematic presentation and withholding of her attention, as well as selective social isolation, to encourage a decrease in the child's aggressive, negative-attention-getting and resisting behaviors and an increase in his social, cooperative, and conforming behaviors. This procedure was introduced to deal with a problem which was disturbing effective classroom management and pupil learning.

Method

Subject

Bobby was one of twelve children enrolled in the Southside School kindergarten of the Education Improvement Program. These children have low socio-economic backgrounds and reside in a poverty area of Durham. Bobby is a white child in a class composed of an equal number of white and Negro children.

When Bobby entered kindergarten, he was described by his teachers as a bright, alert, verbally-skilled and physically well-coordinated child. After refusing several times to enter the testing situation, Bobby did cooperate with the psychometrist during the experimental phase of this study. On the Peabody Picture Vocabulary he scored 105; on the Columbia Mental Maturity Test he scored 104; and on the Stanford-Binet he scored 103, all placing him well within the average range.

The teachers requested a special study using behavior modification techniques after more traditional techniques had proved ineffective with Bobby's disruptive and resistant behavior. Quite frequently he would move away from the kindergarten group and proceed to disrupt the on-going activity. To a disturbing degree, Bobby was physically and verbally assaultive toward other children. On several occasions Bobby had sudden and uncontrollable outbursts. He resisted his teacher's attempt to calm him, whined and cried "leave me alone," and threatened "my Daddy will come beat you up."

Bobby is the middle sibling in a family of three children, having an older sister, age 8, in the third grade and a younger brother, age 2 1/2 years. Both of his parents live at home and his father works in the maintenance department of a large department store. Because of financial difficulties, his mother worked for a year after Bobby's birth. However, the

neighbors reported hearing the children cry, so his mother stopped working. The class social worker feels that the mother is uncomfortable and sometimes confused in her role as a mother. She wants the children's love and affection and lets things get out of hand before setting any limits. On the other hand, the father is very strict with the children.

Prior to entering kindergarten, Bobby had a limited exposure to children of his own age. The parents were very protective and he was never permitted to leave the yard. Consequently, Bobby played with his older sister and her friends and had trouble conforming to their play activities. Frequently a fight resulted and Bobby withdrew to his room, insisting on being alone. This social and family history was gathered to aid in planning the behavior modification treatment and formulating the hypotheses.

Behavioral Categorization and Recording

The scale employed to analyze Bobby's behavioral change was the Coping Analysis Schedule for Educational Settings (CASES) developed by Dr. Robert L. Spaulding (1966). This scale consists of thirteen basic behavior categories, which were further classified into desirable, inappropriate, and unacceptable behavior, as presented in Table 1.

In order to determine the degree of agreement on behavioral classification of this experiment's recorder with that of other observers, several reliability checks were conducted. Twelve separate ten-minute time-sampling checks with two observers classifying the same behavior independently were carried out involving a comparison of this experiment's observer with four other trained recorders. Reliability was computed in terms of exact (precise category agreement) percentage of agreement and percentage of agreement in the molar categories of desirable, inappropriate, and unacceptable behavior.

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Table 1

Modified Coping Analysis Schedule
for Educational Settings (CASES)

DESIRABLE (D)

5a. Self-Directed Activity - working independently on an activity or project with interest.

6. Paying Rapt Attention - listening and attending with interest to the ongoing activity.

7a. Sharing and Helping - contributing ideas and interests, volunteering answers, and helping others.

8a. Social Interaction - mutual interaction through conversation, games, and joint projects.

9. Seeking Support, Assistance, and Information - asking for help, sympathy, and attention from teacher or peers.

10. Following Instructions Passively - conforming to expectations without great interest.

INAPPROPRIATE (I)

5b. Self-Directed Activity - 5a., but at an inappropriate time.

7b. Sharing and Helping - 7a., but at an inappropriate time.

8b. Social Interaction - 8a., but at an inappropriate time.

11. Observing Passively - being distracted from ongoing activity.

12. Responding to Internal Stimuli - no observable interaction with environment.

UNACCEPTABLE (U)

1. Assaultive Behavior - direct verbal or physical attacks or destruction of property.

2. Negative (Inappropriate) Attention-Seeking Behavior - loud or annoying disruptive behavior which seems to be directed toward obtaining the attention of others through unacceptable behavior.

3. Manipulating and Directing Others - bossing others.

4. Resisting Authority - actively or passively refusing to comply with teacher's expectations or requests.

The range of the percentage of exact agreement the observer obtained with the four other observers ranged from 70% to 92%. The percentage of larger category agreement ranged from 86% to 100%. There is, therefore, ample evidence that the system of behavioral classification employed in this study does have meaning and reliability (after teaching) beyond the lone observer.

The data were collected by means of an event recorder which yielded a continuous record of Bobby's behavior. The data paper runs through the recorder at a constant rate and is marked by any of twenty keys. Thirteen keys recorded changes in behavior using the Coping Analysis Schedule. The (a) and (b) subdivisions were recorded by moving the key once for (a) and moving it quickly two times for (b). Four keys recorded the reinforcing teacher's interactions with Bobby.

The teachers' interactions with the subject were classified as follows:

1. Neutral interactions (conversation, standing by);
2. Physical interactions - positive (e.g., patting Bobby on the head) indicated by activating the key once and negative (e.g., taking Bobby to isolation) by activating the key twice;
3. Verbal interactions - positive (e.g., praise) and negative (e.g., warning about impending isolation;
4. Gestural interactions - positive (e.g., smiles, nods) and negative (e.g., frowns, shaking the head, quieting with a finger).

Since M & M candy was used routinely in the kindergarten as reinforcement (not with this study), it was also recorded by a key. These teacher interactions are summarized in Table 2. Finally, one key was used to indicate isolation and another key to indicate a group activity change or any notable change in the environment.

Table 2

Classification of Teacher Interactions

Neutral :	Conversation or relevant proximity without a connotation of explicit approval or disapproval
Positive :	Verbal or non-verbal communication with explicit approval
Negative:	Verbal or non-verbal communication with explicit disapproval or displeasure

As with the categorization of the subject's behavior, reliability checks of the teacher interactions, with an independent observer, were carried out. No attempt was made to calculate agreement on the onset and cessation of an interaction. Rather, the two observers agreed that an interaction was ongoing and independently rated the character of the interaction as positive, negative, neutral or re-directing. Two comparisons were made, each consisting of 40 interactions, between this experiment's observer and one other observer. The first reliability check yielded an exact agreement percentage of 92.11% and the second, obtained during a different experimental condition, yielded an exact agreement percentage of 92.50%. Although the sample of reliability computations is small, the high agreement does indicate that this descriptive division of teacher-pupil interaction has meaning beyond the single observer.

The data taken on the event recorder were analyzed daily. For each activity the data were analyzed to show total time in each category, total frequency in each category and percentage of time in each category during the activity. The total time and percentages were also computed for the more molar classifications of desirable, inappropriate, and unacceptable behavior. The teacher interactions were charted according to the type and length of interaction and Bobby's behavioral changes during the interaction.

Procedure

The present study included five experimental conditions as follows:

1. Baseline.

Bobby's behavior was recorded using the Coping Analysis Schedule for Educational Settings in order to ascertain the operant level of his behavior. The reinforcing teacher's interactions were recorded simultaneously with Bobby's behavior. At first, data were

taken during all of the kindergarten activities and then three activities were chosen for observation and intervention. Freeplay (30 minutes), discussion (10 minutes), and rest (5 minutes) were the activities selected due to the extent and variability of Bobby's undesirable behavior during these activities and the constancy in length of time from day to day.

Having observed Bobby's behavior during the baseline period, the following hypotheses were made:

a. The teacher was positively reinforcing Bobby's negative and aggressive behavior by her disapproval;

b. This disapproval was too mild to serve as punishment and no powerful punishing consequences followed the teacher's threats, so that teacher disapproval had not acquired conditioned punishment properties;

c. Bobby was receiving peer social reinforcement for his aggressive and disruptive behavior;

d. Adult attention would be reinforcing to Bobby; and

e. Isolation would be punishing to Bobby.

2. Social Reinforcement - Treatment 1.

The social (potential) reinforcement was presented on a near-continuous variable-ratio schedule to give Bobby maximum possible adult attention contingent upon desirable behavior and minimum attention contingent upon inappropriate or unacceptable behavior. These behaviors are defined in Table 1. The reinforcement schedule was carried out by only one of the three teachers in the classroom and an effort was made to hold all other variables constant throughout the study. Thus, the reinforcing teacher gave positive social attention

to Bobby for desirable behavior, ignored all inappropriate behavior, and ignored unacceptable behavior unless it was intolerable at which time Bobby was given a short negative verbal threat of isolation. If he did not stop his unacceptable behavior within five to ten seconds, Bobby was put in isolation for five minutes.

The isolation condition meant that he sat by himself in an enclosed cubicle in a room adjoining the kindergarten. Bobby was initially warned that if he were unable to sit there quietly by himself (the teacher immediately returned to the classroom), he would go to the principal's office to sit for ten minutes. If Bobby continued his unacceptable behavior, the principal was to inform the teacher and then Bobby would be taken home. He was not informed of this final ultimatum because it was hypothesized that he might prefer to go home and, therefore, misbehave. The purpose of the teacher's warning and isolation procedure was to develop teacher verbal disapproval as conditioned punishment.

During the entire study, the potential positive social reinforcement consisted of adult attention by standing near his play activity, watching with interest, giving pleased gestural expression, and talking to him in a positive or neutral manner. The negative warning was usually a statement such as, "Bobby, you can either join the group or go sit by yourself for a few minutes."

As the study progressed, it was decided that the social reinforcement treatment should be slightly altered, producing Treatment 1 and Treatment 2. The first treatment consisted of ignoring all inappropriate behavior and ignoring undesirable behavior unless it was intolerable. Bobby seemed able to recognize this limit and emitted very little unacceptable behavior, but slightly increased his inappropriate behavior.

3. Social Reinforcement - Treatment 2.

The reinforcing teacher continued to give positive social attention to Bobby for desirable behavior, but ignored inappropriate behavior only until it became disruptive to the group. Then he was given a verbal warning, followed by isolation if he did not behave within the desirable limit. The second phase of treatment involved, therefore, less stringent requirements for punishment so that the teacher was, in effect, less tolerant.

There is a possible confounding set of circumstances which occurred after two days of Treatment 2. The discussion activity was moved to the first time period of the school day, a change which was maintained. Another, more temporary, change in the freeplay activity was instituted at the same time. For several days, extending throughout the middle five days of Treatment 2, the freeplay activity was slightly more structured than previously. The children were given a choice of three activities to participate in, which were related to an ongoing unit of instruction. These changes do represent slight re-organization of Bobby's school environment and must be considered as possible confounding variables. However, the characteristics of the changes are in the direction of a more structured, stricter classroom environment so that they may be considered, albeit unplanned, part of Treatment 2.

4. Reversal.

This stage was a brief reversal period in which the reinforcing teacher attempted to return to Baseline conditions, as nearly as possible. She interacted with Bobby with disapproval when he was exhibiting inappropriate and unacceptable behavior, but gave no verbal warnings of and no periods of isolation. Thus, she paid attention to him when he

was being disruptive, and not when he was behaving appropriately. This procedure was considered necessary to ascertain whether the teacher's attention and isolation from attention were the significant independent variables. The hypothesis was that if the teacher were the controlling variable, Bobby's behavior would become more undesirable and inappropriate during the reversal condition.

5. Re-introduction of Social Reinforcement.

During this stage the teacher attempted to return to the reinforcement schedule of Treatment 2 in the social reinforcement period.

The reinforcement schedule was gradually shifted from continuous to more intermittent until Bobby received adult attention in an amount normal for the group. After the completion of the study, data were taken on two days to check on the maintenance of the gains. An informal attempt was made to generalize the treatment to the two other teachers who were interacting with Bobby.

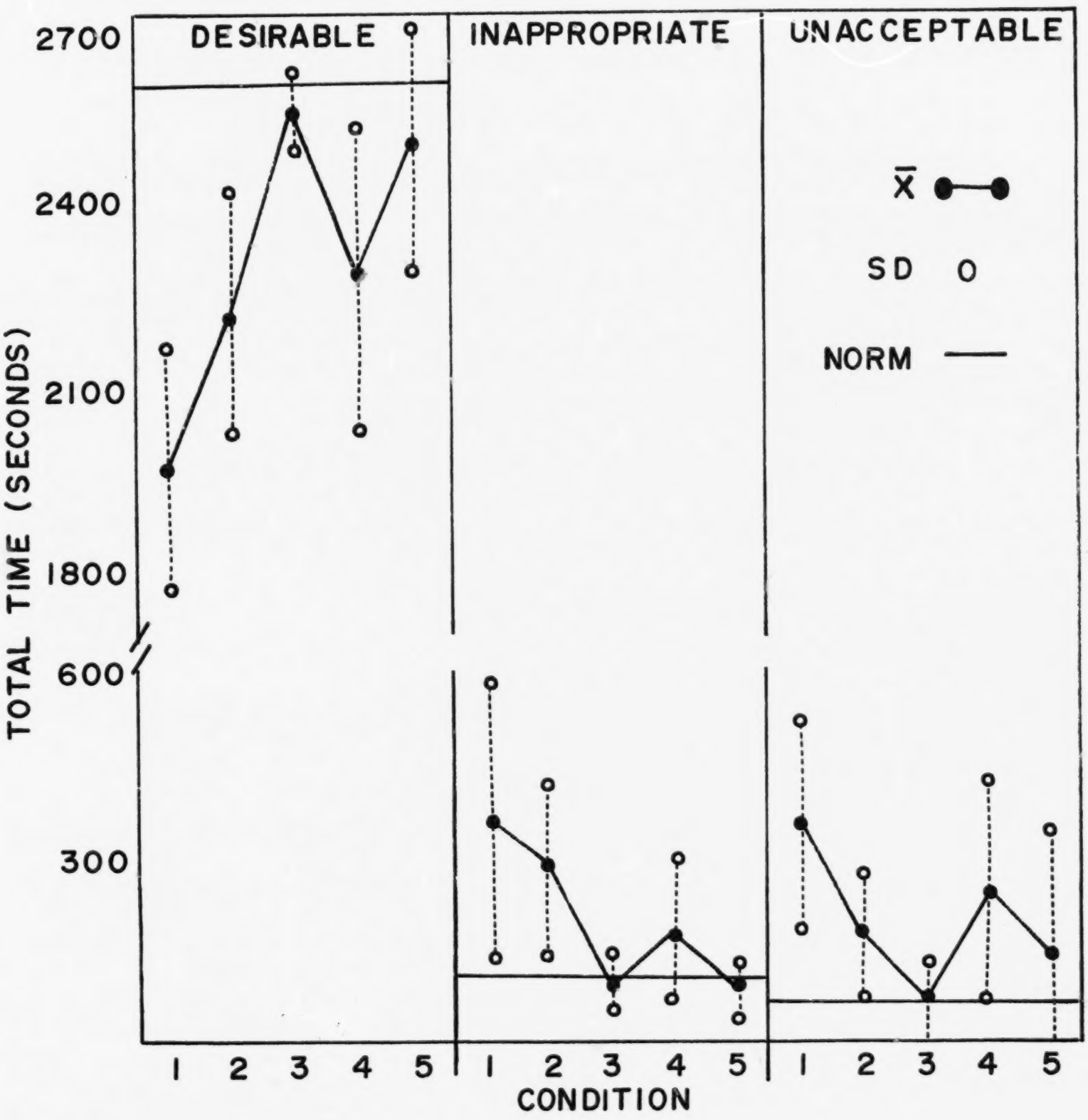
Changes from one stage to the following were instituted according to a criterion set before the study began. The criterion was that on two consecutive days Bobby's percentage of desirable, inappropriate, and unacceptable behavior had to fall within the range of the preceding percentages of that behavior in each of the three activities. Because instability of behavior was one of Bobby's prime characteristics prior to the study, a criterion of stable behavior on consecutive days was held to be untenable during the Baseline. This stability criterion was not enforced during the reversal condition for two reasons. The reversal trend was obviously accelerating in the expected direction and the resumed disturbance to the class motivated the teachers to strongly advocate resumption of the treatment.

Results

The summary data of Bobby's behavior throughout the study indicate a definite increase in desirable and a decrease in inappropriate and unacceptable behaviors as a result of the experimental treatment. Figure 1 shows the overall change in Bobby's behavior in the combined activities, a recorded time of 2700 seconds a day. Freeplay (30 minutes) comprises 66% of the total time, discussion (10 minutes) 22%, and rest (5 minutes) 11%. The days that Bobby was isolated in any one of the three activities were omitted in computing all summary data. It was decided that the time spent in isolation could not justifiably be included in the desirable, inappropriate or unacceptable behavior categories. The isolation day could not be included in this summary data without accounting for the isolation time because a constant total time for each day was desired. The omission of these days has very little systematic effect on these data because isolation days do not categorically indicate the highest unacceptable behavior, as seen in Figures 6, 9, and 12.

Looking at Figure 1, it is evident that the systematic presentation and withholding of adult attention by the reinforcing teacher altered Bobby's behavior when all activities are considered together. During the first treatment of positive social reinforcement (Condition 2) there is a 9% increase from Baseline in mean desirable behavior and during the second treatment (Condition 3) there is an additional increase of 12% in desirable behavior as compared to the first treatment. The effect of the two treatments is also shown by the 10% decrease in inappropriate behavior and 11% decrease in unacceptable behavior from Condition 1

Fig. 1. Combined activities: Mean and standard deviation of subject's behavior by experimental condition (1 - Baseline, 2 - Treatment 1, 3 - Treatment 2, 4 - Reversal, 5 - Re-introduction).



to Condition 3. Bobby's behavior becomes more stable in the second treatment as shown by the smaller standard deviation.

In some instances the mean minus one standard deviation yields a negative number, (e.g., Conditions 3 and 5 in unacceptable behavior) indicating that the distribution within the condition is not normal. Therefore, the use of the standard deviation is questionable, but in most cases the distribution is held to be normal so that the usefulness outweighs the occasional inapplicability. In this study, a negative standard deviation indicates that Bobby was consistently good, having several days of 100% desirable behavior or 0% inappropriate or unacceptable behavior.

During Reversal (Condition 4) there is a marked decrease in desirable behavior and increase in undesirable behaviors, although these trends do not replicate the Baseline data. With the re-introduction of social reinforcement (Condition 5) his behavior again improves.

The theoretical curves for Bobby's behavior would be similar to the curves shown in Figure 1. Theoretically, the desirable behavior curve would increase from Baseline through the second treatment, decrease to about the same level as Baseline in Reversal, and then increase again in Re-introduction. The inappropriate and unacceptable theoretical curves would show the reverse trends, decreasing in Conditions 2 and 3, increasing in Condition 4, and then decreasing the last condition. As shown in Figure 1, the means of all three behaviors follow the theoretical curves with the exception of Condition 4 not returning to the Baseline level, and desirable and unacceptable behavior in Re-introduction not replicating the mean of Condition 3.

The norms in these data represent the behavior of all boys in Bobby's kindergarten group as shown in Table 3. In Treatment 2 the mean for Bobby's desirable behavior is only

Table 3

Boys in Southside Morning Kindergarten

Desirable, Inappropriate, and Unacceptable Behavior by Activity

	Desirable	Inappropriate	Unacceptable
Freeplay:			
Percent	98.38	.97	.65
Mean Time (Seconds)	1,770.84	17.46	11.70
Discussion:			
Percent	89.63	7.32	3.05
Mean Time (Seconds)	537.78	43.92	18.30
Rest:			
Percent	88.24	6.37	5.39
Mean Time (Seconds)	264.72	19.11	16.17
Combined Activities:			
Percent	94.83	3.14	2.03
Mean Time (Seconds)	2,560.41	84.78	54.81

slightly below the norm and his inappropriate and unacceptable behavior fell on or below the norm.

Graphic presentation of the means in the various experimental conditions is one way in which any behavioral changes can be evaluated. The question of the significance of a particular decrease or increase may be raised, especially when the ranges within the two conditions overlap. There appear to be no statistical techniques ideally suited to a one subject experiment in which the data from different days are not independent. It was decided to employ traditional analysis of variance and t tests although the interpretation of these statistics must be severely modified. They cannot be employed inferentially, only descriptively. They permit a comparison of two condition means while taking into account the variance within the conditions.

An analysis of variance on the sample of days in each condition (combined activities) was computed, yielding a main experimental treatment effect significant at the .01 level. A series of t tests were calculated comparing every combination of the experimental treatment effect on desirable and unacceptable behavior as shown in Table 4.

There are several differences between conditions which the experimental hypotheses predict. Without large differences at these points, the success of the experiment would be in doubt. The experimental hypotheses predict that there should be significant ($p<.05$) differences between Baseline and Treatment 1, Baseline and Treatment 2, Baseline and Re-introduction.

Table 4

Matrix of t Tests and Probabilities

Unacceptable Behavior / Desirable Behavior	Baseline	Treatment 1	Treatment 2	Reversal	Re-introduction
Baseline		t=2.734 p<.02	t=4.081 p<.01	t=1.296 p<.30	t=2.628 p<.02
Treatment 1	t=2.94 p < .01		t=2.380 p<.05	t=.9275 p<.40	t=.4413 p<.70
Treatment 2	t=7.27 p<.01	t=4.571 p<.01		t=2.391 p<.05	t=.9887 p<.40
Reversal	t=2.783 p<.02	t=.6101 p<.60	t=2.471 p < .05		t=1.052 p<.40
Re-introduction	t=6.008 p<.01	t=3.158 p<.01	t=.8377 p<.50	t=1.806 p<.10	

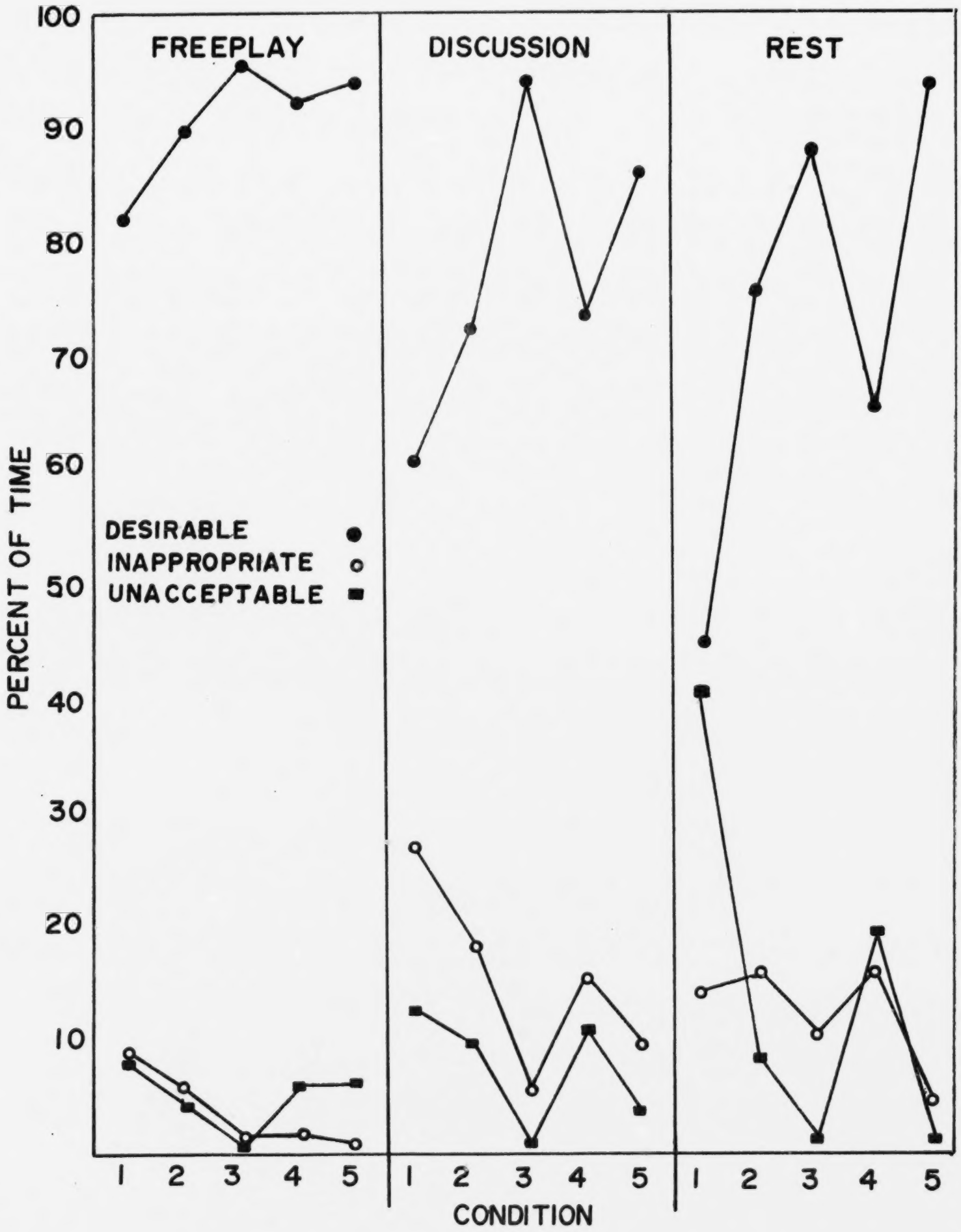
In brief, all the social reinforcement and punishment conditions should resul in more desirable and less unacceptable behavior. On the other hand, Baseline and Reversal should not be greatly different as the latter condition was administered to demonstrate the reversibility of the behavior.

In examining Table 4 and considering the unacceptable behavior, it is evident that Baseline is significantly different from both original treatments and the Re-introduction of the treatment. Also as expected, Baseline and Reversal were not significantly different. Additional findings were that Treatment 1 was significantly different from Treatment 2, and Treatment 2 was significantly different from Reversal, as expected.

Considering desirable behavior, it is evident that Baseline is significantly different from both treatments and Re-introduction as predicted, but it is also different from Reversal. To explore this difference further, one can look at Reversal in comparison to the other conditions. Reversal is significantly different from Treatment 2, as well, so that the t test substantiates the graphic evaluation that desirable behavior did decrease significantly during the Reversal as compared to Treatment 2, but it did not fall to the Baseline level.

The percentages of time in desirable, inappropriate and unacceptable behaviors for the three activities are shown in Figure 2. All of these curves follow the predicted theoretical curves with the exception of inappropriate behavior in freeplay and rest, and unacceptable behavior in freeplay. Bobby's behavior was more variable in discussion and rest than in freeplay. In rest, the slight increase in inappropriate behavior in Condition 2 may be explained by Bobby's possible discrimination between unacceptable behavior for which he was isolated and inappropriate behavior which was ignored by the teacher, but reinforced by his peers. The introduction of the stricter second treatment, isolation for inappropriate behavior, (Condition 3) was accompanied by a decrease in inappropriate behavior.

Fig. 2. Percentage of desirable, inappropriate, and unacceptable behavior by activity and condition (1 - Baseline, 2 - Treatment 1, 3 - Treatment 2, 4 - Reversal, 5 - Re-introduction).



Deviations from the theoretical curves will be further discussed as each activity is considered separately. The purpose of Figure 2 is to allow a general comparison of the results in each activity to those of the other two.

Freeplay

Due to the nature of freeplay, the reinforcing teacher was able to interact with Bobby on a near-continuous schedule during this activity. During Baseline there was a minimum of interaction as shown by the very low means in Figure 3. Twenty-eight percent of the total interactions (57) were negative, meaning that the teacher was giving Bobby considerable attention for his aggressive behavior. With the introduction of the treatment there is a large increase in both the number and length (Figure 4) of neutral interactions as planned. In the second treatment (Condition 3) one notes a slight decrease in the number of interactions, although there is a further increase in the length of interactions indicating fewer but longer conversations with Bobby. Consideration of the variability of neutral interactions further supports the contention that the teacher was indeed different in Treatment 1 and Treatment 2 from Baseline and Reversal. In Condition 2, there is a decrease in negative interactions to about 3% of total interactions which is maintained in Condition 3. Positive interactions fell in Treatment 2 after an initial increase in Treatment 1, as planned.

In Reversal (Condition 4) there is a marked decrease in the number of neutral and positive interactions, returning to the Baseline condition, but a failure to increase negative interactions as desired. Again, in Re-introduction there is a large increase in the number and length of neutral interactions and an increase in number of positive interactions. During Re-introduction the number of negative interactions increased in response to Bobby's increased aggressive and name-calling behavior, resulting from an incident outside of school, to be

Fig. 3. Freeplay: Mean and standard deviation of frequency of teacher interaction by experimental condition (1 - Baseline, 2 - Treatment 1, 3 - Treatment 2, 4 - Reversal, 5 - Re-introduction).

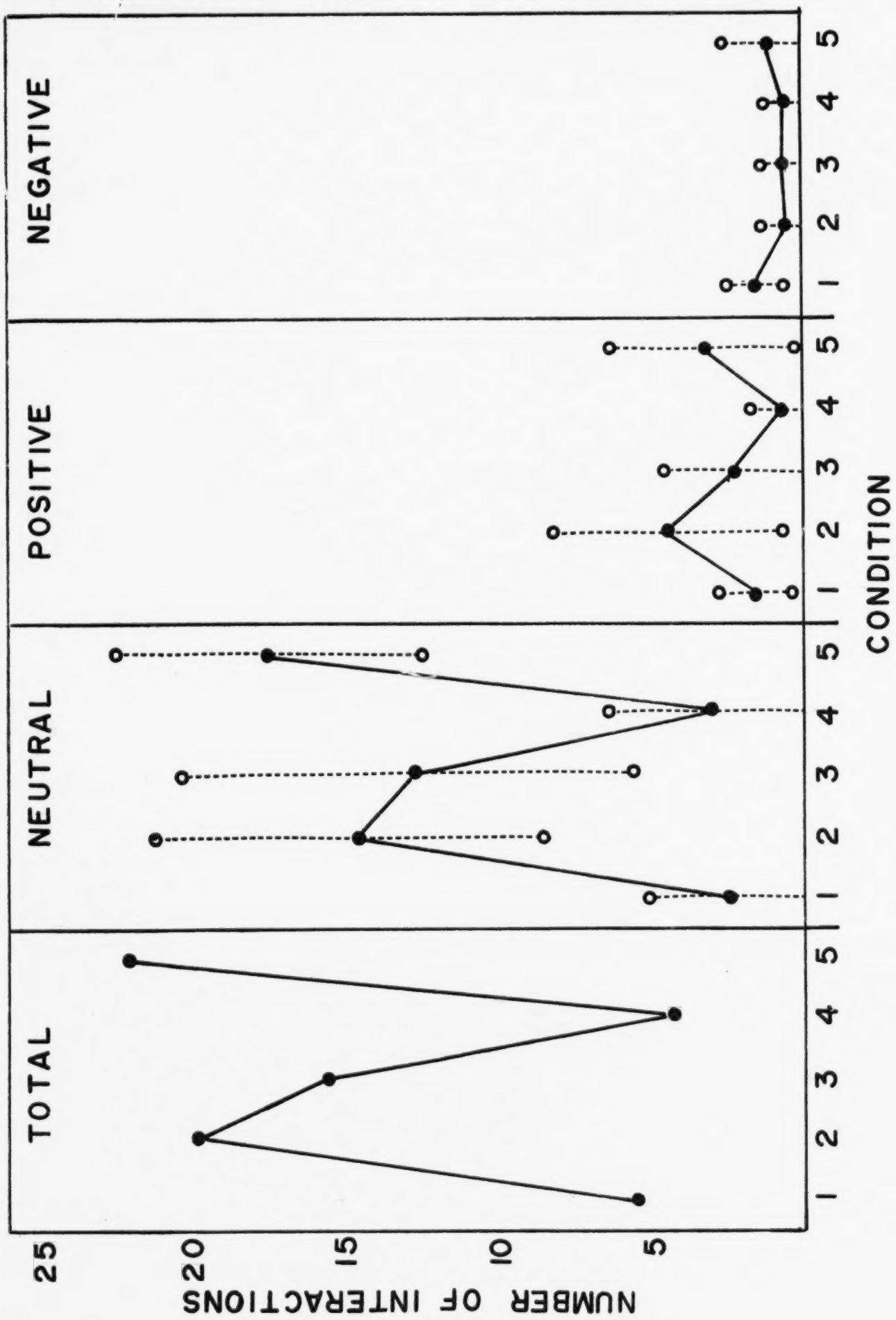
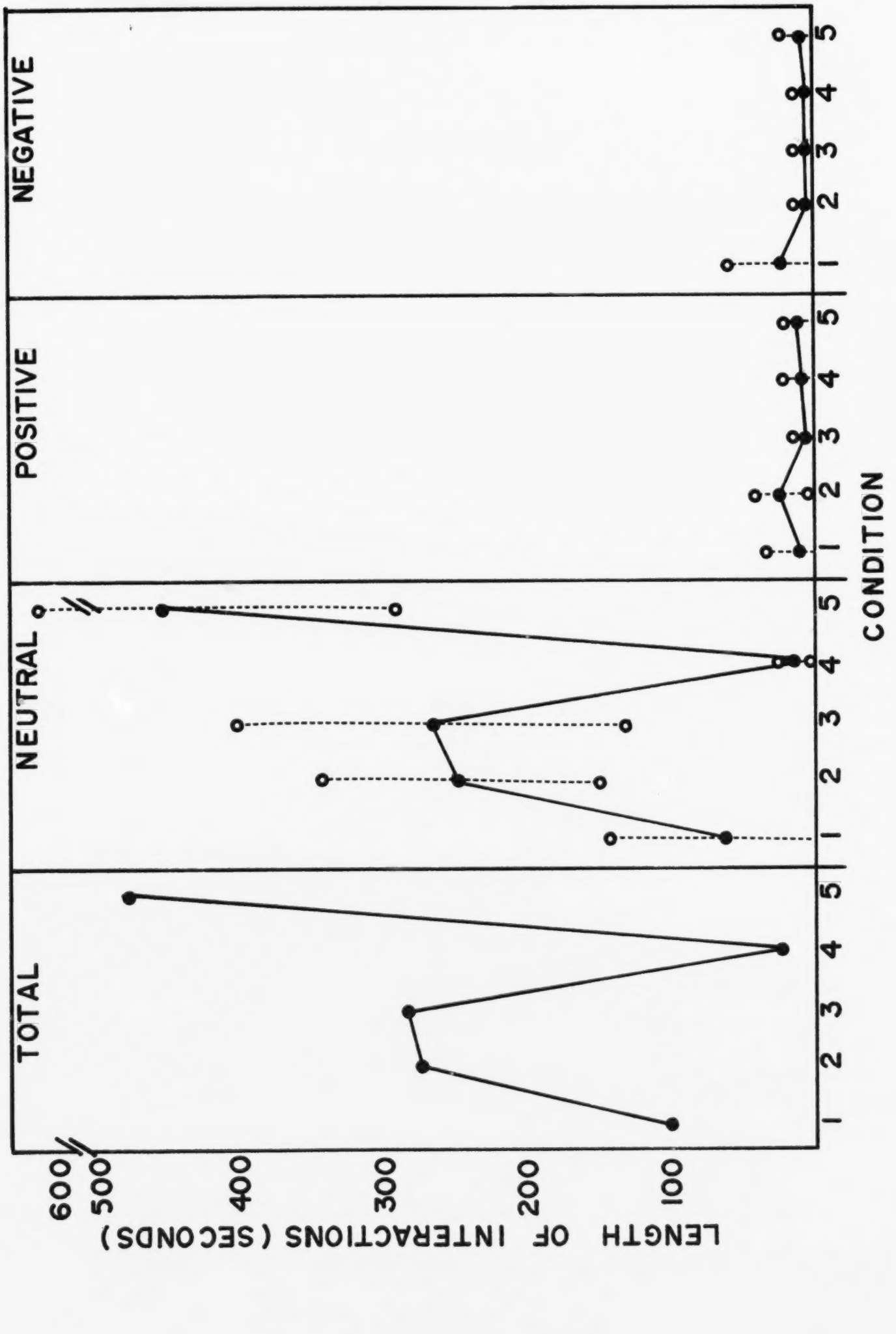


Fig. 4. Freeplay: Mean and standard deviation of length of teacher interaction by experimental condition (1 - Baseline, 2 - Treatment 1, 3 - Treatment 2, 4 - Reversal, 5 - Re-introduction).



discussed in following paragraphs. As a result, the general curves of negative interactions for freeplay (Figures 3 and 4) do not conform to the theoretical curves. The standard deviations of neutral interactions show the greatest variability in number and length as compared to positive and negative interactions.

The data in Table 5 indicate Bobby's behavior that preceded and followed each teacher interaction. These data are presented in order to analyze Bobby's behavior which summoned a teacher interaction and his immediate behavioral reaction to the interaction. It is interesting to compare the total number of interactions in the four conditions. In 10 days of Baseline there were only 57 teacher interactions, whereas in 22 days of treatment there were 400 interactions. Within the matrices, in Treatments 1 and 2 and Re-introduction, the percentage of neutral interactions following desirable behavior doubled that of Baseline. Bobby's inappropriate behavior was almost totally ignored in the Treatment and Re-introduction, whereas 16% of all interactions in Baseline followed inappropriate behavior. In comparing Baseline and Reversal, one notes that the teacher did not achieve the same dispersement of interactions in Reversal.

As shown in Figure 5, Bobby's mean desirable behavior sharply increased from Baseline throughout treatment. Although there was a decrease in desirable behavior in Reversal, it did not fall to the level of Treatment 1. The corresponding rise in Re-introduction was minimal. This lack of a desirable behavior increase will be discussed in the following paragraph. The inappropriate and unacceptable curves both exhibited the expected decrease during treatment, but the curves showed deviation from theoretical curves in that inappropriate behavior did not rise during Reversal and unacceptable behavior did not decline during Re-introduction. In general, Bobby's behavior was least variable during Treatment 2. The desirable and unacceptable behavior varied more during Re-introduction than any other condition, but as seen

Table 5

Freeplay: Percentage of desirable (D), inappropriate (I), and unacceptable (U) subject behavior preceding and succeeding neutral (N), positive (+), and negative (-) teacher interaction.

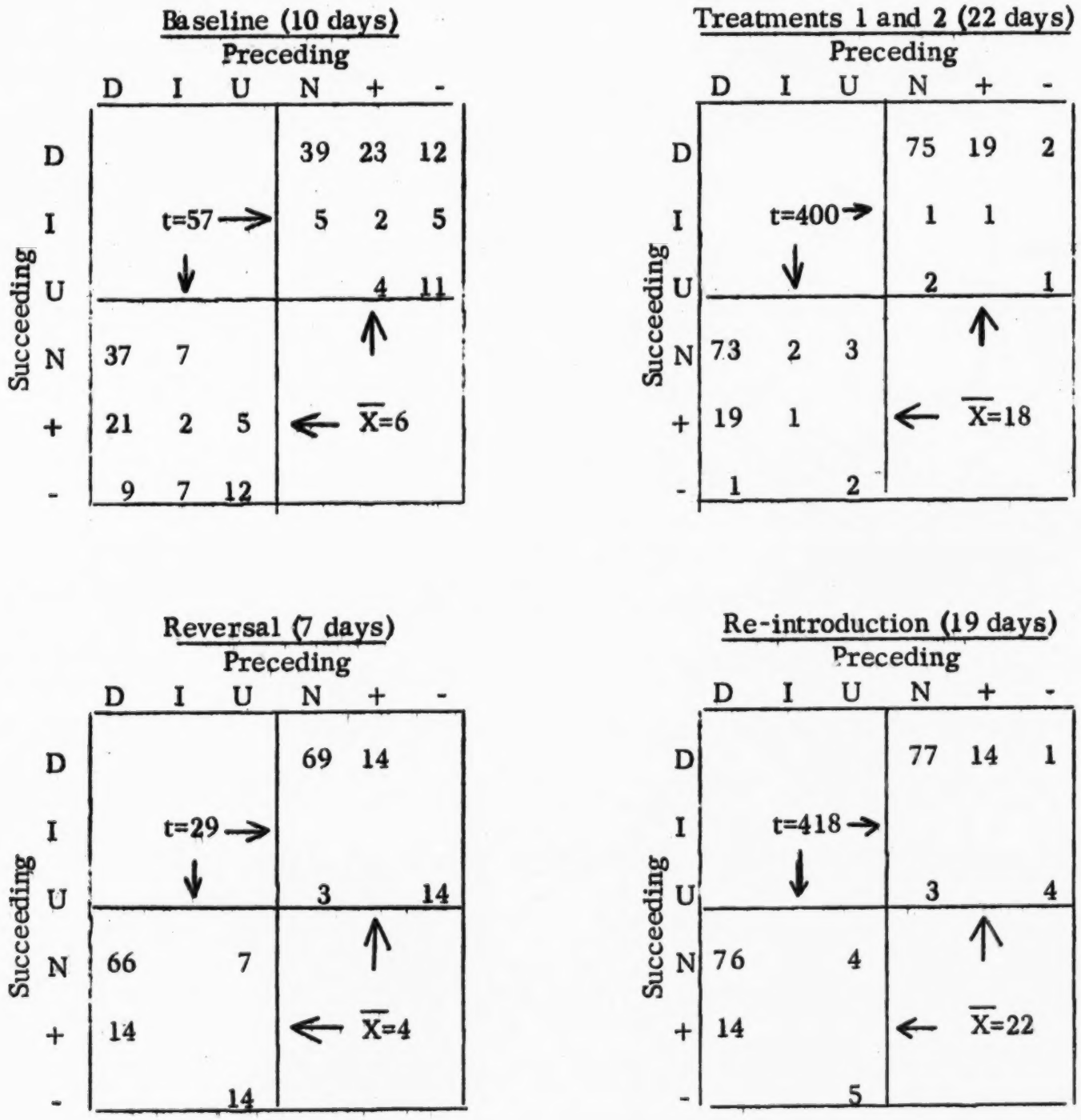
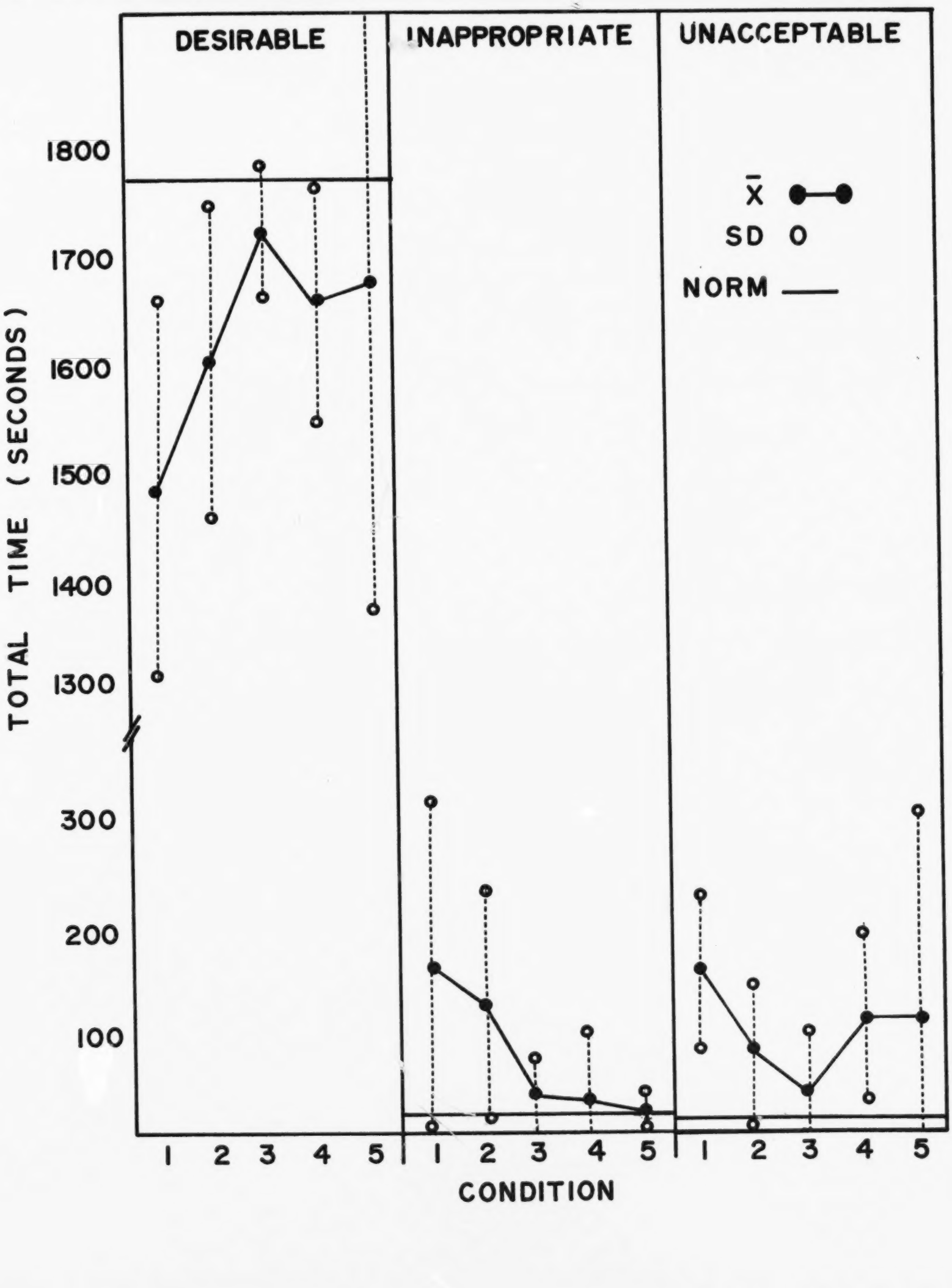


Fig. 5. Freeplay: Mean and standard deviation of subject's behavior by experimental condition (1 - Baseline, 2 - Treatment 1, 3 - Treatment 2, 4 - Reversal, 5 - Re-introduction).

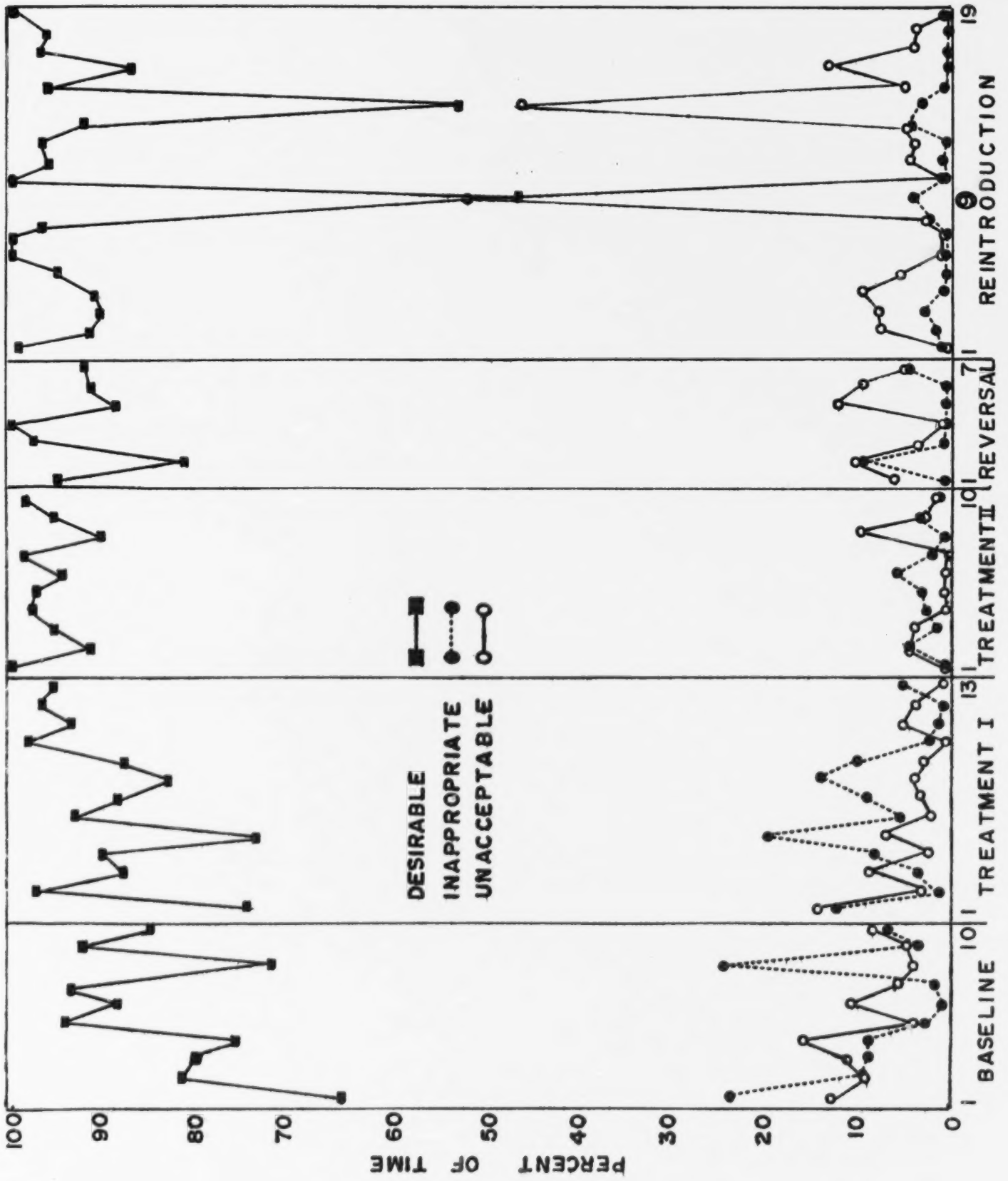


in the day-by-day analysis it is due primarily to two extremely atypical days. In considering the norms for boys in the kindergarten, Bobby's behavior was closest to the norm during Treatment 2 and Re-introduction with the exception of unacceptable behavior.

As seen in Figure 6, during the 10 days of Baseline (Condition 1) there is considerable variability, whereas in the second treatment (Condition 3) his behavior becomes more stable. In the first three conditions one notes an increase in Bobby's desirable behavior and a decrease in inappropriate and unacceptable behavior, although the change is somewhat irregular in progression. During Reversal Bobby's behavior became less desirable and more variable. In Re-introduction his behavior improved once again. During this condition an aggressive incident occurred outside of school which is correlated with Bobby's high percentage of unacceptable behavior, primarily name-calling, on days 9 and 14. Inappropriate physical discipline was administered by an adult Negro aide on the way home from school which disturbed Bobby's parents sufficiently that they allowed Bobby the choice of returning to school or dropping out. Bobby was no doubt cognizant of the frantic efforts of teachers and social workers to effect his return to school. He persisted in threatening teachers that he would withdraw from school. On subsequent days in school Bobby's aggressive behavior toward the Negro children increased and his racial name-calling was more evident.

In computing the percent of time in each behavioral category during the activity, the problem of how to represent the days on which isolation occurred had to be solved. To represent isolation as a fourth category was considered to be misleading because the other three behavioral categories' percentages would be out of proportion with other days. Therefore, for the activity graphs the percentages for days on which isolation occurred were computed by dividing the total time in each category by the total time spent in the activity

Fig. 6. Freeplay: Daily percentage of desirable, inappropriate, and unacceptable behavior by experimental condition; days during which isolation occurred are circled.



having subtracted isolation time. On first consideration it may seem that this analytical procedure would result in the minimization of those days which indicate the highest percent of inappropriate or unacceptable behavior. However, in analyzing each of the three day-by-day graphs (Figures 6, 9, and 12), it can be seen that this assumption is unfounded.

In the freeplay activity it is interesting to note the change in Bobby's social behavior within the desirable category. During Baseline 54% of his desirable behavior was self-directed activity (category 5) and 42% was social interaction (categories 7 and 8). It was hoped that desirable social behavior could be encouraged without sacrificing Bobby's self-directed behavior. In the social reinforcement conditions Bobby's self-directed behavior decreased (46%), whereas social interaction increased (50%). In Reversal both of these desirable behaviors are about 47%. During Re-introduction Bobby's social interaction again became the larger percentage - self-directed activity, 43%, and social interaction, 55%, as in the social reinforcement conditions.

Bobby's behavioral change within the unacceptable category during freeplay is also interesting to analyze. In looking at his total unacceptable behavior in Baseline, 51% was aggressive behavior (category 1) and 25% was "bossy" manipulation of others. During the two treatments, 73% of his unacceptable behavior was "bossy" manipulation and only 4% was aggressive. During Reversal, Bobby's aggressive behavior (38%) is again higher than "bossy" manipulation (21%), thus paralleling the Baseline. In Re-introduction both aggressive (45%) and bossy-manipulative (38%) behaviors are comparatively high, which is perhaps related to the aggressive incident outside of school.

Approximately two weeks following the final day of Re-introduction, data were taken during all three class activities to allow a partial check on maintenance of the treatment

situation and on Bobby's behavior. A similar check was made approximately four weeks after the end of Re-introduction. In summary, the first check revealed that Bobby's behavior during freeplay was 99% desirable and 1% unacceptable. At the second check his behavior was 89% desirable, 1% inappropriate, and 10% unacceptable. Although the latter estimate of unacceptable behavior is higher than expected, considering these two days as a sample of post-experimental behavior, it is evident that no gross reversion has occurred in freeplay.

Discussion

Another teacher was in charge of this activity which usually consisted of sharing time, talking about the calendar day and weather, and sometimes planning for a special event. The general behavior required of the children is consistent within all these activities. The reinforcing teacher was always a part of the group, but able to have only a minimum of interaction with Bobby. In looking at Figure 7, it is difficult to see a consistent pattern of interaction other than the total interaction curve. In Baseline there were no positive interactions and only a mean of two neutral and a mean of four negative interactions. Prior to commencement of the treatment the reinforcing teacher played a role of passive observer or setting behavior limits. In Conditions 2 and 3 one notes an increase in negative interactions which consisted mainly of verbal warnings to Bobby. Neutral interactions increased considerably in Condition 2, but then positive interactions increased in Condition 3. In Reversal there is an approximate return to Baseline conditions and in Re-introduction, an increase in interactions as planned. In freeplay the character of the expected treatment was that of increasing neutral and positive interactions; while the primary change in the discussion activity consisted of making negative interactions a more powerful contingency with a secondary emphasis on neutral and positive interactions. The differential nature of the activity dictated the differential treatment to obtain desirable behavior.

Fig. 7. Discussion: Mean frequency and length of teacher interaction by experimental condition (1 - Baseline, 2 - Treatment 1, 3 - Treatment 2, 4 - Reversal, 5 - Re-introduction).

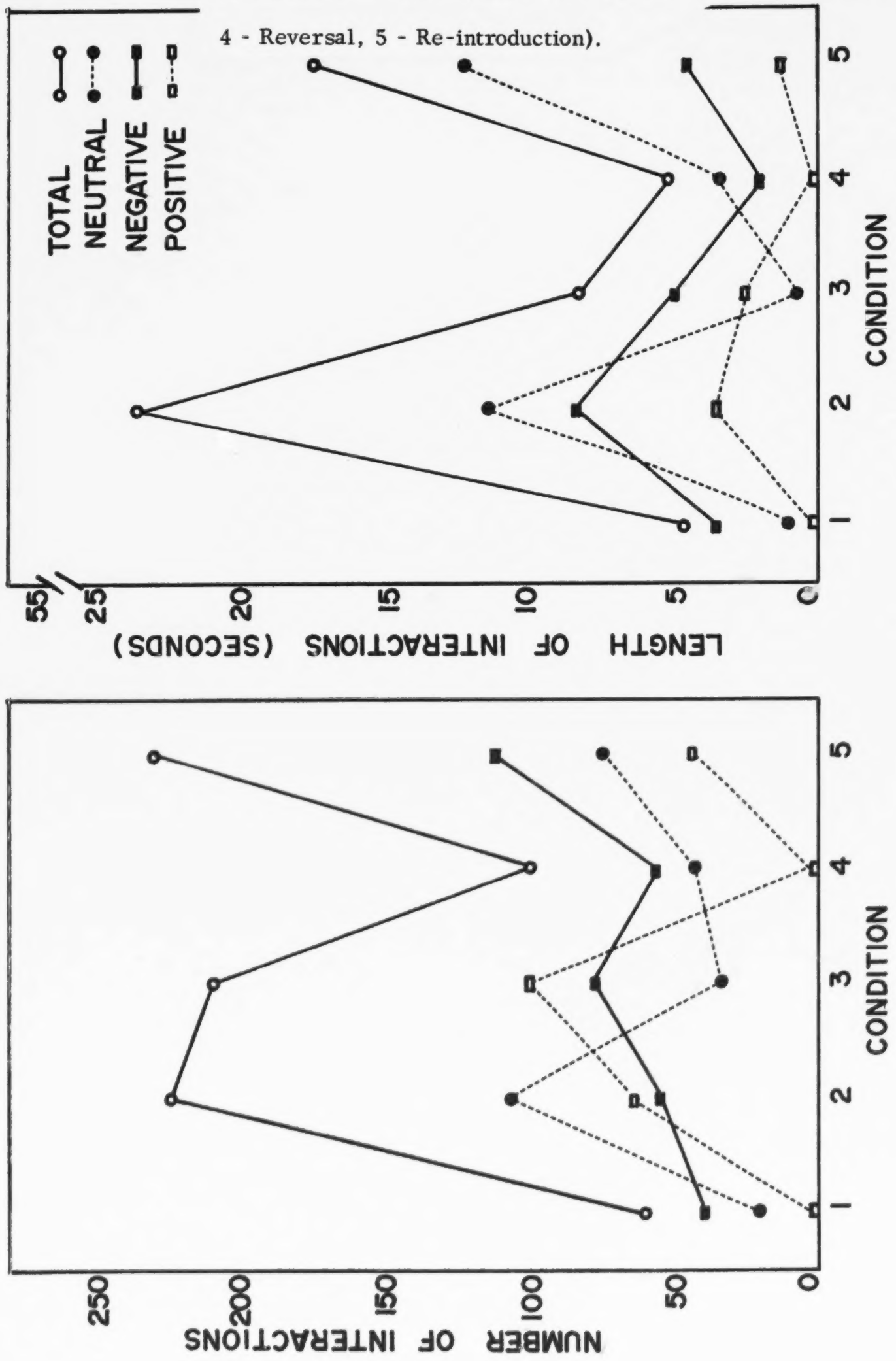


Table 6

Discussion: Percentage of desirable (D), inappropriate (I), and unacceptable (U) subject behavior preceding and succeeding neutral (N), positive (+), and negative (-) teacher interaction.

Baseline (10 days)

Succeeding \ Preceding	D	I	U	N	+	-
D				33		17
I		t=6 →				17
U		↓				33
N	33			↑		
+				← $\overline{X}$=1		
-	17	17	33			

Treatments 1 and 2 (22 days)

Succeeding \ Preceding	D	I	U	N	+	-
D				33	35	6
I		t=48 →				4
U		↓		2		19
N	33	2		↑		
+	35			← $\overline{X}$=2		
-	4	8	17			

Reversal (7 days)

Succeeding \ Preceding	D	I	U	N	+	-
D				29		
I		t=7 →				
U		↓		14		57
N	29		14	↑		
+				← $\overline{X}$=1		
-			57			

Re-introduction (19 days)

Succeeding \ Preceding	D	I	U	N	+	-
D				26	16	12
I		t=43 →		7	2	19
U		↓				19
N	26	7		·		
+	16	2		← $\overline{X}$=2		
-		19	30			

In considering the total number of interactions shown on Table 6, one sees a minimum number of interactions during Baseline, a large increase during Treatment, a return to Baseline conditions during Reversal, and an increase again during Re-introduction. In Baseline there is an equal percentage of neutral interactions following desirable behavior and negative interactions following unacceptable behavior, whereas, in the treatment neutral and positive interactions following desirable behavior are almost equal. In Re-introduction the high percentage of negative interactions following unacceptable behavior relates to Bobby's racial name-calling and mimicking other children during the discussion.

The means of all three behavior categories in discussion (Figure 8) follow the predicted theoretical curves with the exception that in all three cases Reversal reproduced the approximate level of the means of Treatment 1 instead of Baseline. Again, the variability of Bobby's behavior is least during Treatment 2. In comparison to the norm data, in Treatment 2 Bobby's mean time in all three categories fell to the favorable side of the norm mean, and this achievement was almost paralleled by the Re-introduction data.

Bobby's behavior in discussion was extremely variable during the Baseline as shown in Figure 9. The extent of class disruption by Bobby can be evaluated by comparing his behavior to the norm for boys (3% unacceptable behavior) in the same kindergarten. In Conditions 2 and 3 there is a definite improvement in Bobby's behavior, and an increase in stability. An overall estimate of this stable improvement can be gained by noting the separation of the desirable curve from the inappropriate and unacceptable curves.

Bobby was isolated for the first time on the second day of Condition 2 in this activity. He did not remain in isolation as the teacher had told him and, therefore, was taken to the principal's office for 10 minutes. After this occurrence, Bobby responded to the teacher's

Fig. 8. Discussion: Mean and standard deviation of subject's behavior by experimental condition (1 - Baseline, 2 - Treatment 1, 3 - Treatment 2, 4 - Reversal, 5 - Re-introduction).

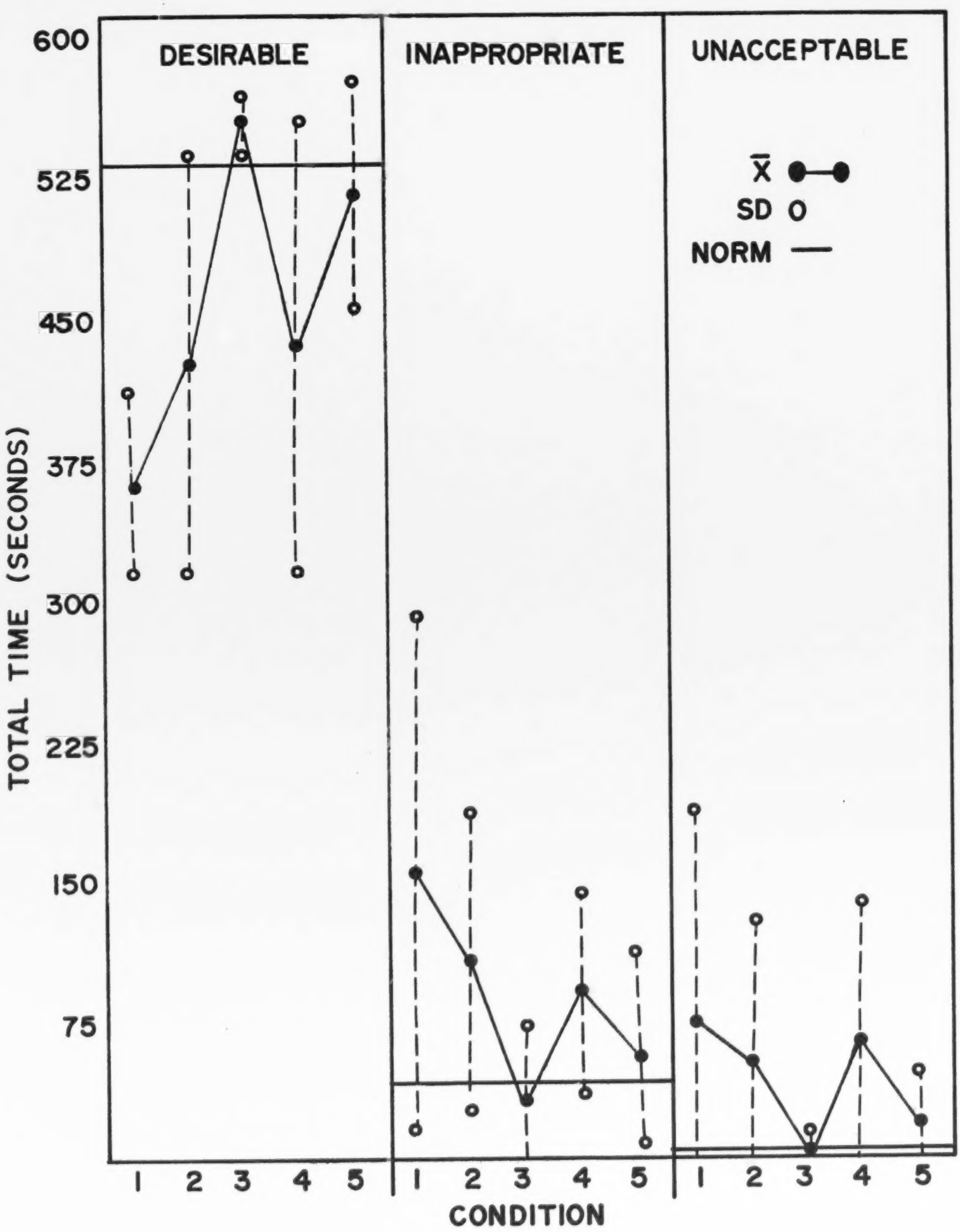
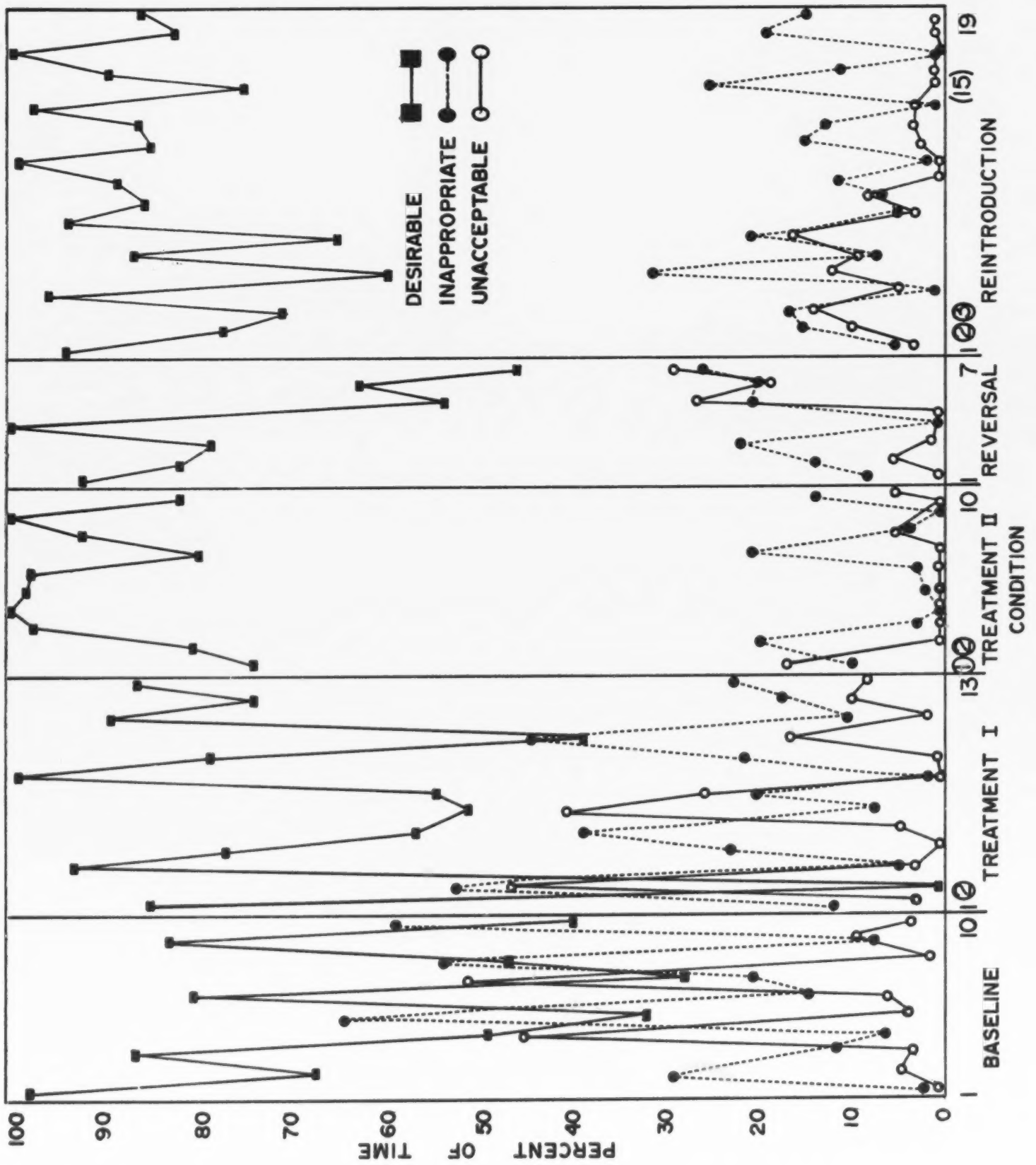


Fig. 9. Discussion: Daily percentage of desirable, inappropriate, and unacceptable behavior by experimental condition; days during which isolation occurred are circled.



warning and was not isolated again during discussion in that treatment. As shown in Figures 8 and 9, his behavior in discussion still needed improvement and, therefore, the stricter second treatment (Condition 3) was introduced. On days 1 and 2 Bobby was isolated again in line with the more stringent contingencies, but did not require being taken to the principal's office. Thus, in Condition 3 unacceptable behavior decreased strikingly and inappropriate behavior became more consistently lower. In Condition 4 one notes a definite accelerating reversal in Bobby's behavior. Again, in Re-introduction his behavior improved, although somewhat erratically.

In looking at Bobby's unacceptable behavior during the discussion, his negative-attention getting behavior (Category 2) was the highest percentage throughout the conditions. Quite often Bobby appeared to be bored by the discussion, and would mimic other children, make loud noises, or annoy others.

During the two maintenance checks following Re-introduction, Bobby's behavior in discussion was maintained at a high desirable level, 99% after two weeks and 95% after four weeks.

Rest

The reinforcing teacher was usually in charge of rest, a time when the children lay down on a mat, talked quietly to a neighbor, or sometimes looked at a book. The teacher was limited in the number of interactions possible during this activity because it was a quiet time. As shown in Figure 10, during Baseline the greatest percentage of interactions was negative (67%). These interactions seem to be actually encouraging Bobby's disruptive behavior for which he also received peer attention. During treatment, a decrease in negative interaction is noted as well as an increase in positive and neutral interactions, so that during Treatment 2 negative interaction represented the smallest percent. The decrease in negative interaction or "nagging," is particularly evident when the length of interaction is considered. The neutral

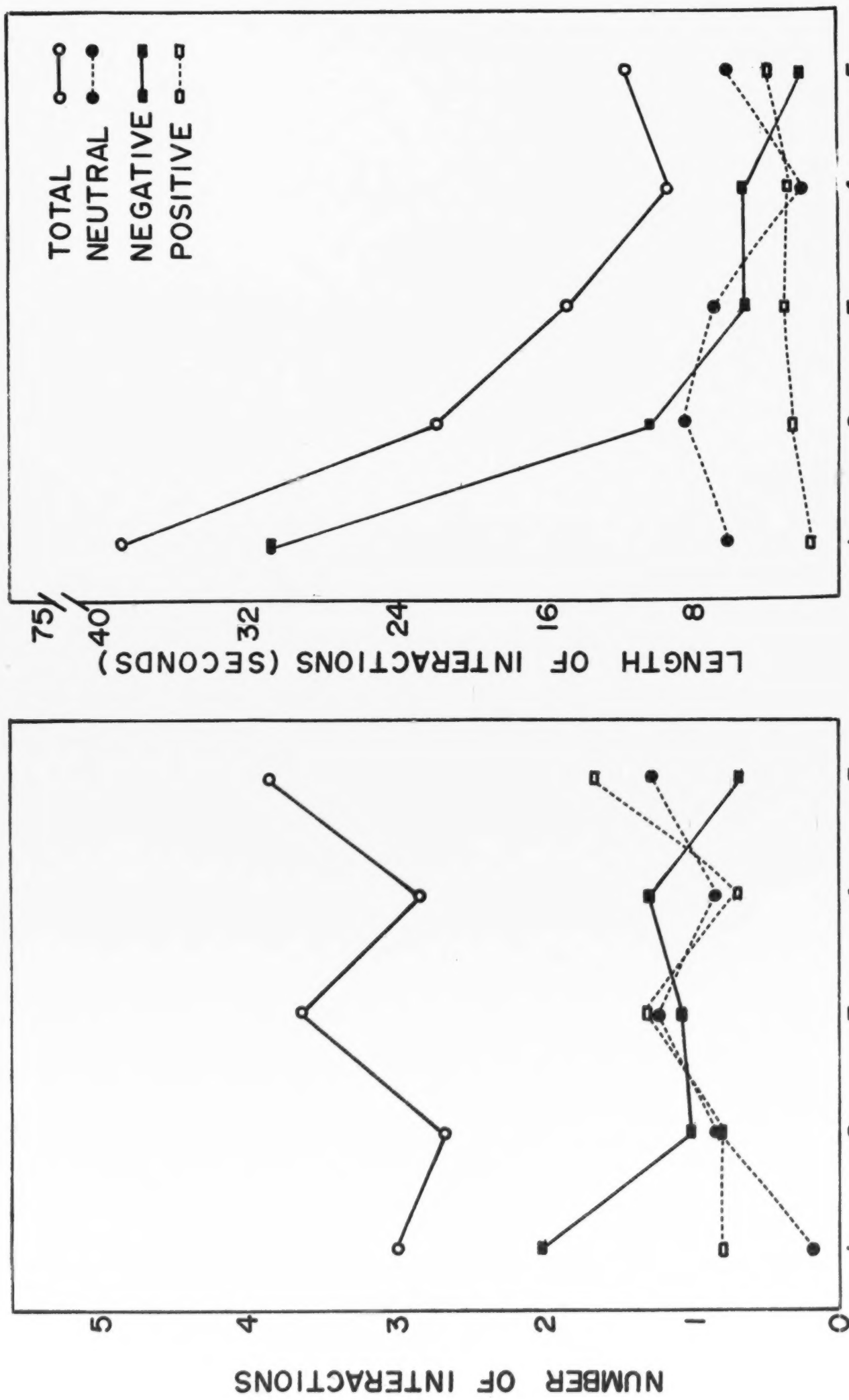


Fig. 10. Rest: Mean frequency and length of teacher interaction by experimental condition (1 - Baseline, 2 - Treatment 1, 3 - Treatment 2, 4 - Reversal, 5 - Re-introduction).

interactions in this activity occurred when Bobby engaged the teacher in a quiet conversation while he was resting. In Reversal there was a slight increase in negative interactions and a decrease in positive and neutral interactions, so that negative interaction again comprised the largest percent. During Reintroduction the neutral and positive interactions increased again and the negative decreased, as desired.

The matrices in Table 7 again show considerable change in the total number of interactions in the four conditions. In Baseline 63% of all interactions were negative being preceded and followed by unacceptable behavior. In Treatment 1 and 2 the pattern of interaction changed, having the greatest proportion of interactions being neutral and positive preceded by desirable behavior. In Reversal the percentage of negative interactions increased, but not to the same proportion as Baseline. In Re-introduction the proportions return almost exactly to those of the treatment condition.

In considering Figure 11 it is evident that all three behavior categories follow the theoretical trends with the exception of a slight increase in inappropriate behavior with the introduction of the first treatment. This increase in inappropriate behavior served as the primary impetus for the introduction of the stricter treatment. Considering the desirable and unacceptable categories, it is clear that Bobby demonstrated striking improvement in this activity under the experimental contingencies. In these two categories his means were the same or better than the norm in Treatment 2 and in all three categories the Re-introduction data are well on the favorable side of the norms. The changes in variability are also striking, particularly within the unacceptable category where in Treatment 2 and Re-introduction the mean plus one standard deviation falls below the norm line. It is of interest to note that the greatest

Table 7

Rest: Percentage of desirable (D), inappropriate (I), and unacceptable (U) subject behavior preceding and succeeding neutral (N), positive (+), and negative (-) teacher interaction.

Baseline (10 days)

Succeeding \ Preceding	D	I	U	N	+	-
D				3	27	
I		t=30 →				3
U		↓		3		63
N	3		3		↑	
+	27			←	$\bar{X}$=3	
-		3	63			

Treatments 1 and 2 (22 days)

Succeeding \ Preceding	D	I	U	N	+	-
D				31	31	6
I		t=68 →				9
U		↓		1	3	19
N	28	6	1		↑	
+	31	1		←	$\bar{X}$=3	
-	3	12	19			

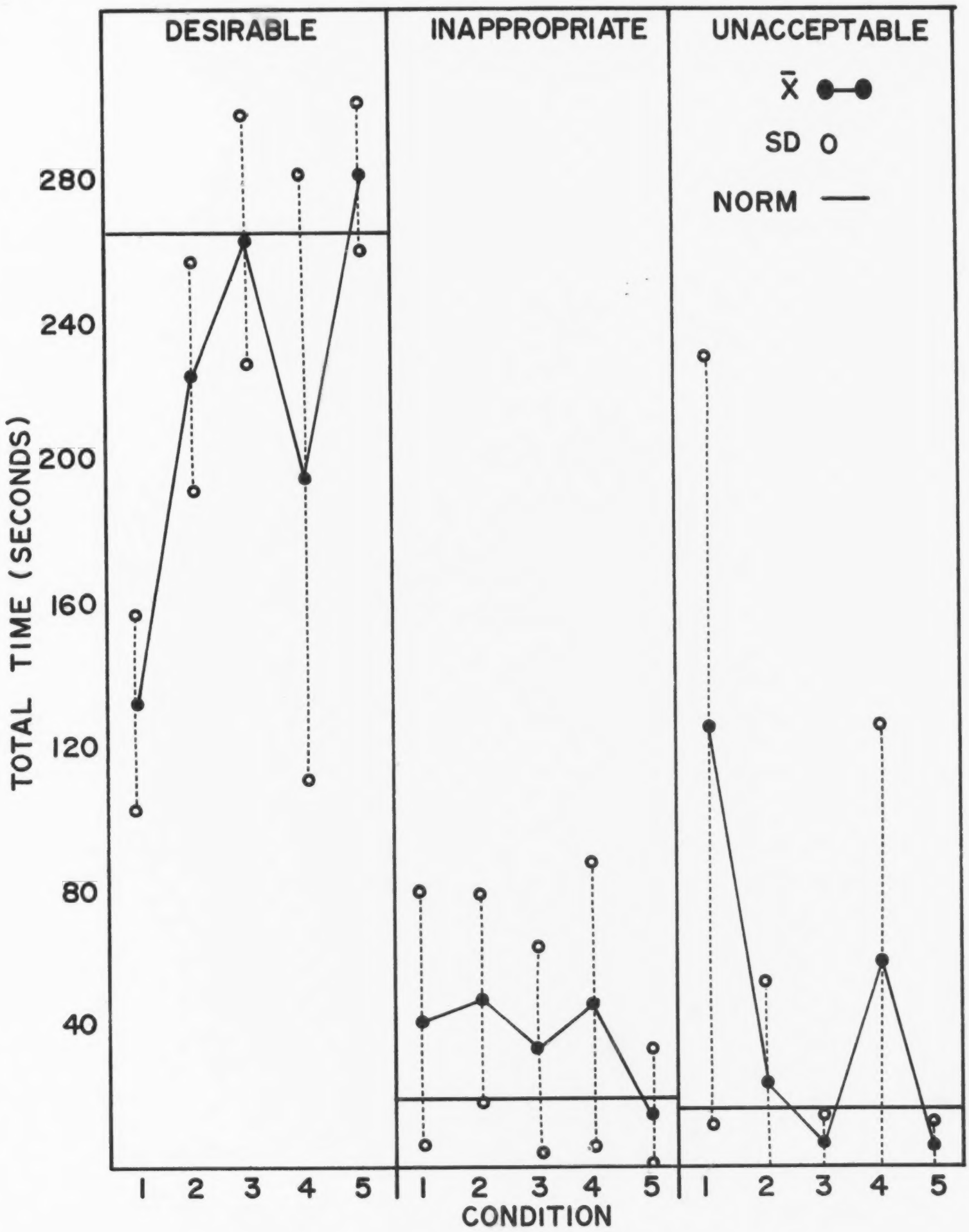
Reversal (7 days)

Succeeding \ Preceding	D	I	U	N	+	-
D				15	20	5
I		t=20 →				15
U		↓		15	5	25
N	15		15			
+	20		5	←	$\bar{X}$=3	
-	5	15	25			

Re-introduction (19 days)

Succeeding \ Preceding	D	I	U	N	+	-
D				32	45	4
I		t=73		3	1	8
U				1		5
N	29	5	1		↑	
+	45	1		←	$\bar{X}$=4	
-		10	8			

Fig. 11. Rest: Mean and standard deviation of subject's behavior by experimental condition (1 - Baseline, 2 - Treatment 1, 3 - Treatment 2, 4 - Reversal, 5 - Re-introduction).



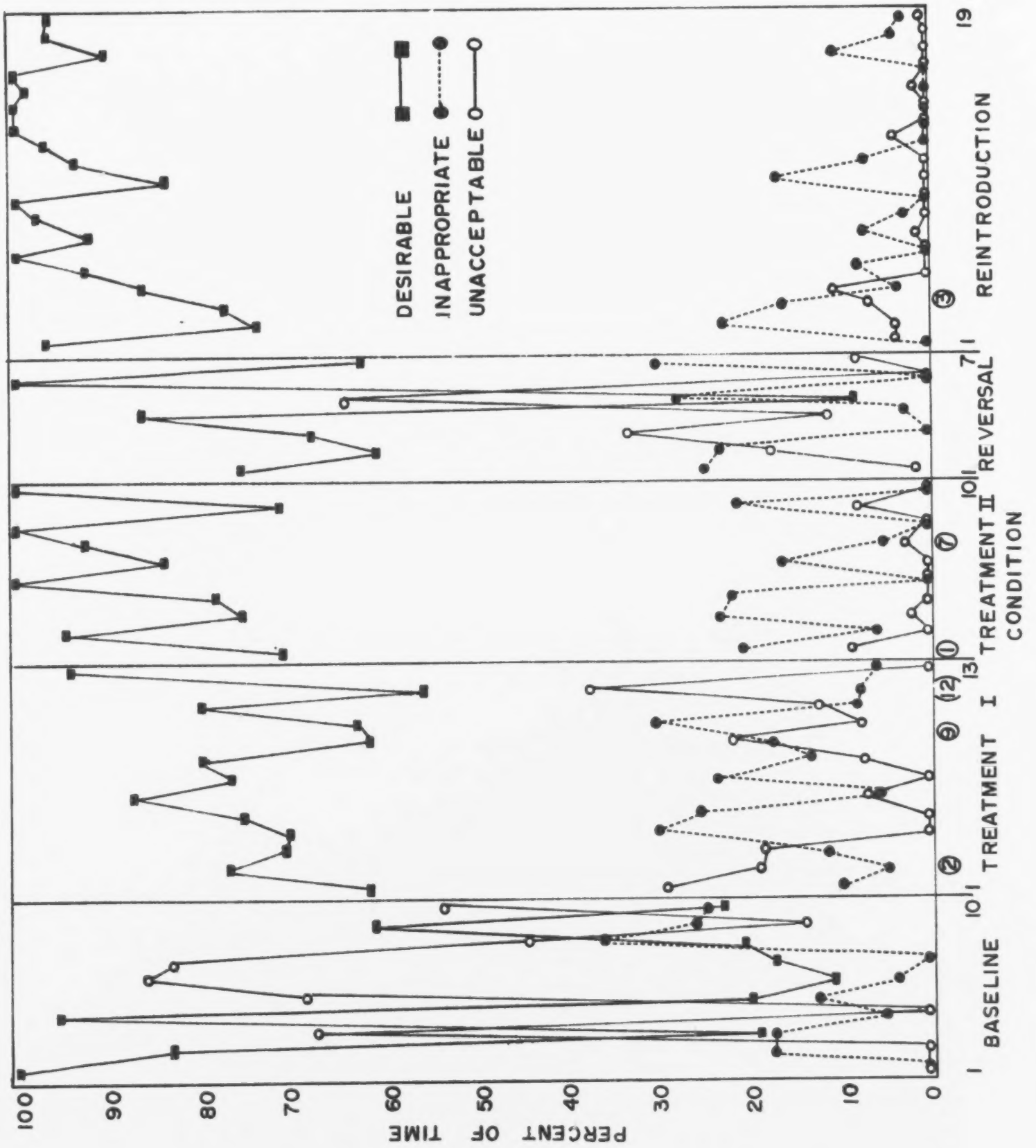
success of the treatment was demonstrated in the activity in which Bobby had exhibited the most inconsistent and unacceptable behavior during the Baseline.

Bobby's behavior was the most variable during rest (Figure 12) in the Baseline condition and at times rose greatly above the norm of 5% unacceptable behavior. With the introduction of the first treatment (Condition 2) his unacceptable behavior became less extreme so that the desirable curve became entirely separate from those of inappropriate and unacceptable behavior. One notes a slight increase in inappropriate behavior, again signifying perhaps that Bobby quickly recognized the unacceptable behavior for which he was isolated and/or that the extinction procedure for inappropriate behavior was not effective. To support this hypothesis, in the stricter second treatment his inappropriate behavior decreased overall when punished, while desirable continued to increase and unacceptable to decrease.

During the two treatments of social reinforcement Bobby was isolated 5 times during rest. On the second day of the first treatment, when he had previously been isolated and sent to the principal's office during discussion, he was isolated again in rest and he stayed there quietly. In the first days after Christmas vacation Bobby was isolated twice. Presumably, he was testing the limits again. On the first day of the second treatment he was also isolated and at one other time during this Condition. In Reversal Bobby's behavior became less desirable and the unacceptable increased strikingly. In Re-introduction his behavior improved rapidly and decisively. It is interesting to note that the experimental treatment appears to have been most effective in the situation in which Bobby was most unpredictable and most extremely a problem.

In rest during the two maintenance checks, Bobby maintained a high desirable level, 100% after two weeks and 91% after four weeks.

Fig. 12. Rest: Daily percentage of desirable, inappropriate, and unacceptable behavior by experimental condition; days during which isolation occurred are circled.



Discussion

The baseline data supported the teacher's concern about Bobby's disruptive, resistant and aggressive behaviors. They also indicated that his behavior was extremely variable and unpredictable. With the introduction of the first treatment of positive social attention contingent upon desirable behavior, ignoring all inappropriate behavior, and punishing unacceptable behavior, Bobby's behavior showed a marked improvement and with the second treatment, giving positive social attention contingent upon desirable behavior and punishing inappropriate and unacceptable behavior, his behavior stabilized at a desirable level. During the reversal Bobby's behavior regressed sufficiently to indicate that the reinforcing teacher's attention and isolation from attention were significant independent variable affecting Bobby's behavior. In the re-introduction of experimental Treatment 2, Bobby's behavior returned to a desirable level. Bobby was no longer considered a behavior problem to the teachers.

The presence of two other teachers in the kindergarten somewhat complicated the administration of reinforcement by the experimental teacher. The others were at times reticent to interact with Bobby or sometimes they would inadvertently contradict the reinforcing teacher. As a result, subsequent studies have involved collecting data on all teachers present.

After a survey literature in this field, this investigation appears to be one of the first (Gallagher, 1967) to employ a comprehensive system of a child's behavior in attempting to modify his behavior. Previously, operant studies have discussed a single behavior to be analyzed and modified. In this study the continuous and all-inclusive record of Bobby's behavior and of the simultaneous teacher interactions gives a comprehensive picture of the situation.

The results of this study indicate that the systematic use of social reinforcement techniques in the classroom can significantly change a child's behavior, even when the target is more comprehensive than the single operant. The procedures described offer a clear, objective guide for discriminating occasions to present and to withhold positive reinforcement.

References

Allen, K. Eileen, Hart, Betty, Buell, Joan S., Harris, Florence R. & Wolf, M. M. Effects of social reinforcement on isolate behavior of a nursery school child. In Ullman, L. P. & Krasner, L. (Eds.), Case studies in behavior modification. New York: Holt, Rinehart & Winston, Inc., 1965.

Brison, D. W. Case studies in school psychology: A non-talking child in kindergarten. Urbana, Ill.: University of Illinois, 1966. (mimeographed report)

Gallagher, J. J. Classroom behavior modification techniques applied to educationally deprived, primary children. Durham, N. C.: Education Improvement Program, Duke University, 1967.

Harris, Florence R., Johnston, Margaret K., Kelley, C. Susan, & Wolf, M. M. Effects of positive social reinforcement on regressed crawling of a nursery school child. J. Ed. Psychol., 1964, 55, 35-41.

Johnston, Margaret K., Kelly, C. Susan, Harris, Florence R., & Wolf, M. M. An application of reinforcement principles to development of motor skills of a young child. Child Develpm., 1966, 37, (2), 379-387.

Spaulding, R. L. A coping analysis schedule for educational settings (CASES). Durham, N. C.: Education Improvement Program, Duke University, 1966.

Staats, A. W. (Ed.) Human learning. New York: Holt, Rinehart & Winston, Inc., 1964.

Ullman, L. P. & Krasner, L. (Eds.) Case studies in behavior modification. New York: Holt, Rinehart & Winston, Inc., 1965.